

CLAIMS

[Claim 1] A scanning electron microscope, comprising:

an electrode which is located under an objective lens, and to which a voltage can be applied independently, and

a sample stage which is located under said electrode, and to which a voltage can be applied independently, said sample stage being used for mounting a sample thereon,

wherein said sample is set up between said electrode and said sample stage such that an arbitrary equipotential surface and the surface of said sample coincide with each other, said arbitrary equipotential surface being formed by a parallel electric potential, said parallel electric potential being generated between said electrode and said sample stage by applying each of said voltages to said electrode and said sample stage.

[Claim 2] The scanning electron microscope according to Claim 1, wherein said sample is a sample whose substrate is formed of an insulating substance, said insulating substance being exposed on a part or the whole of said surface of said sample.

[Claim 3] The scanning electron microscope according to Claim 1, wherein said electrode is a flat-plate electrode having a hole through which an electron beam can pass, said hole provided in said flat-plate electrode being of a size which prevents a potential

over said flat-plate electrode from being substantially exerted on said sample surface, relationship between D and L satisfying $D/L \leq 1.5$ when letting diameter of said hole be D and distance between said flat-plate electrode and said sample be L.

[Claim 4] The scanning electron microscope according to Claim 1, wherein said sample stage is larger than area of said sample.

[Claim 5] The scanning electron microscope according to Claim 1, wherein said sample stage is geometrically similar to shape of said sample.

[Claim 6] The scanning electron microscope according to Claim 1, wherein the upper surface of said sample stage or a specific surface thereof on which said sample is mounted is formed into a structure, said structure being planarized over an area larger than said sample and having no projections and depressions within said surface, said upper surface or said specific surface being a surface which is directly opposed to the bottom surface of said sample.

[Claim 7] The scanning electron microscope according to Claim 1, wherein depth of an excavated structure or height of a spacing structure is smaller than one-half of thickness of said sample, said excavated structure or said spacing structure being provided in said sample stage so as to mount said sample therein or thereon.

[Claim 8] A sample observation method, comprising a step of, when said sample whose substrate is formed of

an insulating substance such as glass or quartz is observed in said scanning electron microscope according to Claim 1, setting a voltage which is to be applied to said electrode, at a voltage which becomes positive with reference to a potential on said sample stage, and which becomes positive by a few V to a few tens of V with reference to a potential on said sample surface.

[Claim 9] The sample observation method according to Claim 8, further comprising a step of changing said voltage, which has been applied to said electrode, in a range in a continuous manner or in a step-by-step manner in the midst of irradiating an electron beam onto said sample, said range ranging from a few V to a few tens of V in a direction which is negative with reference to said initial value of said voltage.

[Claim 10] The sample observation method according to Claim 9, wherein an irradiation area of said electron beam on said sample in the midst of changing said voltage applied to said electrode is sufficiently larger as compared with an area to be observed.

[Claim 11] A scanning electron microscope capable of automatically changing said voltage applied to said electrode in said sample observation method according to Claim 9, said scanning electron microscope, comprising means for measuring secondary-electron quantity or reflected-electron quantity generated from said sample, wherein, if said secondary-electron quantity or said reflected-electron quantity has become

larger or smaller than threshold values determined in advance, said scanning electron microscope automatically terminates said change in said voltage applied to said electrode, and sets said voltage at that time as said initial value of said voltage.

[Claim 12] A scanning electron microscope, comprising means for measuring secondary-electron quantity or reflected-electron quantity generated from said sample in said sample observation method according to Claim 9, wherein, if said secondary-electron quantity or said reflected-electron quantity has become larger or smaller than threshold values determined in advance, said scanning electron microscope automatically terminates said change in said voltage applied to said electrode.

[Claim 13] The scanning electron microscope according to Claim 11, wherein said threshold values according to Claim 11 are specific luminance of an image and number of pixels belonging to said specific luminance, said image being formed based on secondary-electron signals or reflected-electron signals.

[Claim 14] The scanning electron microscope according to Claim 12, wherein said threshold values are specific luminance of an image and number of pixels belonging to said specific luminance, said image being formed based on secondary-electron signals or reflected-electron signals.

[Claim 15] The scanning electron microscope according

to Claim 12, wherein said means according to Claim 12 for measuring said secondary-electron quantity or said reflected-electron quantity is an electron detector, said electron detector being a Wien filter including an electric field and a magnetic field, or a potential-blockage type energy filter equipped with an electrode, said electrode being capable of generating a potential which turns out to become a barrier against energy possessed by said secondary electrons or said reflected electrons.